

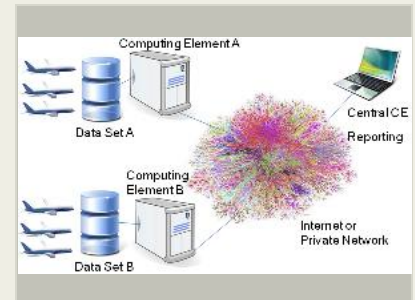
Distributed Data Mining for Aircraft Health Management, Phase II

Completed Technology Project (2012 - 2014)



Project Introduction

Aircraft Flight Operations Quality Assurance (FOQA) programs are implemented by most of the aircraft operators. Vast amounts of FOQA data are distributed between many computers, organizations, and geographic locations. This project develops methodology for transforming such distributed data into actionable knowledge in application to aircraft health management from the vehicle level to the fleet level to the national level. The distributed data processing methodology provably obtains the same results as would be obtained if the data could be centralized. The data mining methods are efficient and scalable so that they can return results quickly for 10Tb of distributed data. This data mining technology that we call Distributed Fleet Monitoring (DFM) developed in SBIR Phase I satisfies these requirements. The data are transformed into models, trends, and anomalies. The model training and anomaly monitoring are formulated as convex optimization and decision problems. The optimization agents are distributed over networked computers and are integrated through remote connection interface in a scalable open grid computing framework. Though the data and the computations are distributed, they yield provably the same optimal solution that would be obtained by a centralized optimization. DFM feasibility was demonstrated in the problem of monitoring aircraft flight performance from fleet data using large realistic simulated datasets. We demonstrated efficient computation of quadratic optimal solution by interacting distributed agents. The feasibility demonstration successfully recovered aircraft performance anomalies that are well below the level of the natural variation in the data and are not directly visible. The algorithms are very efficient and scalable. Phase I demonstration extrapolates to processing 10Tb of raw FOQA data in under an hour to detect anomalous units, abnormal flights, and compute predictive trends.



Distributed Data Mining for Aircraft Health Management

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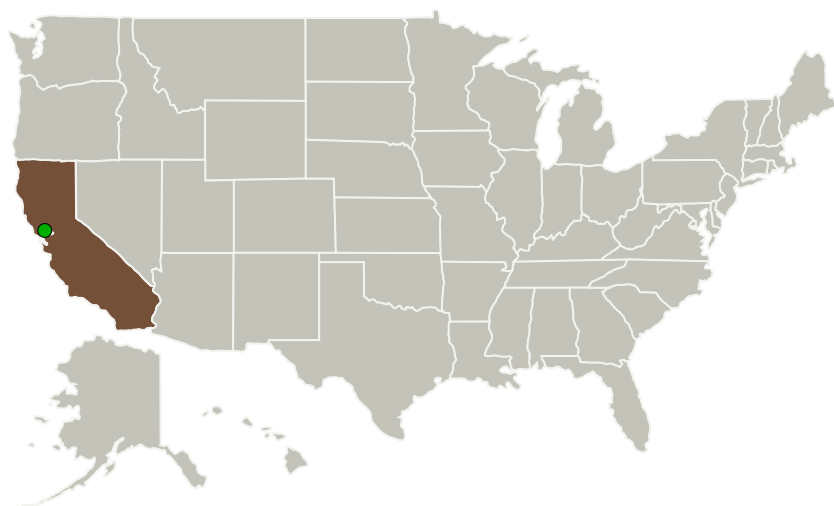
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Mitek Analytics LLC	Lead Organization	Industry	Palo Alto, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

California

Project Transitions

**April 2012:** Project Start**April 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138021>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mitek Analytics LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

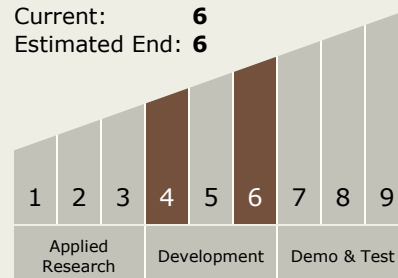
Carlos Torrez

Principal Investigator:

Dimitry Gorinevsky

Technology Maturity (TRL)

Start: 4
 Current: 6
 Estimated End: 6

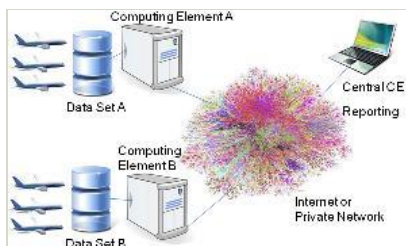


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Images



Project Image

Distributed Data Mining for Aircraft Health Management

(<https://techport.nasa.gov/image/128803>)

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.4 Information Processing
 - └ TX11.4.5 Cyber Infrastructure

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System